International Journal of Civil, Structural, Environmental and Infrastructure Engineering Research and Development (IJCSEIERD)
ISSN(P): 2249-6866; ISSN(E): 2249-7978
Vol. 4, Issue 2, Apr 2014, 139-146

THE ROLE OF NANOTECHNOLOGY TO MINIMIZE THE USE OF PLASTIC WATER BOTTLES & ITS IMPACT ON GLOBAL SUSTAINABLE ENVIRONMENT

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ABSTRACT

Nanotechnologies assist in solving the environmental challenges. World has over 7 Billion's of population, out of which Million people are in daily life used to purchase plastic water bottles during their travel, in trains, buses, cars, flights, trams during their breakfast, lunch and dinner etc. It will be a crucial/innovative step to introduce the nanotechnology based water filtration system in the means of transport for the minimization of potable drinking water bottles. Due to rapid rate of urbanization and development activities changes in the human life style has led the exponential rise of plastic water bottles. Purification of water is a prerequisite necessity for safe drinking diagnostic for the development of healthy environment. The present study envisages on the improvement of water quality in the provision for safe water supply and treatment. Chemicals released from burning bottles posses a health risk to people and contribute to the break down of Earth's Ozone layer. Nanotechnology for water remediation is playing a crucial role in water filtration. In this paper we also focuses on the use of economic approaches to water management that can increase the efficiency of water use and water security, thus providing to sustainability and economic growth. Sustainability & Economic regulations will promote the market value for development of water filtration technologies.

KEYWORDS: Economic Values, Health, Management, Nanotechnology, Plastic Bottles, Purification, Potable Water, Water Resources

INTRODUCTION

Securing and managing access to clean water is a major global challenge both for developing and more economically developed countries. The provision of safe drinking water free of pathogenic microbiological and chemical contaminants is an essential requirement for protecting public health. The global water supply is being stressed further as human population continues to grow exponentially. The increase in natural disasters (floods and droughts) will further complicate issues of water availability and quality. Due to rapid increase in population and development activities changes in life style day by day, increasing the numbers of used water bottles waste thrown out by human population, poses a huge threat to animals and for environment in daily life. Nanotechnology and nanoengineering produces significant advances in fields of water treatment and it is called 'platform' technology as it modify endorse or clarify any existing scientific concept, when merge with other technology. The aim of drinking water quality management is to increase the efficiency of water use and is to minimize the health risks associated with either direct or indirect use of water.

Growing population of water sources especially through industry effluents is affecting the availability of safer water besides causing environmental and health hazards. In India many parts of the country the rivers are heavily polluted and their water is now becoming poison. Access to water from polluted rivers for sanitation and hygiene is even more serious problem, due to inadequate sanitation, and lack of sewage treatment polluting the water sources. Electricity generation by waste [***1***] as well as electricity generation by water is also an important perspective to change the global environment. Nanotechnology has global role in water purification technology and access of water for sustainable development**.** To save this world from the impact of plastic water bottles hazard, diagnostic and prognostic are the prerequisite demand for supporting this Nanotechnology based filtration in the means of transport to meet the global sustainable development.

ROLE OF NANOTECHNOLOGY- IN WATER PURIFICATION & HEALTH

According to World Health Organization (WHO) report, water borne diseases kill nearly 12 Million people every year [2]. Due to Impure water problems from rivers and sanitation especially in villages always chance for epidemic disease. The bacteria, viruses and protozoa that cause waterborne disease, other danger bacteria like *E. coli* or other types of bacteria that causes disease like typhoid, diarrhea etc. Nanotechnology has the potential for improving disease diagnostic. An earlier report on Fluoride contamination in ground water at the border of Uttar Pradesh & Madhya Pradesh, India, has been published [3]. Worldwide, according to United Nations Environment Programme over 2Billion people depend on aquifers for their drinking water [4].

Nanotechnology has led the potential to solve the technological challenges associated with the removal of contaminants such as fluoride in water. Sensors in water and more particularly biosensors are essentially used for recognizing, measuring, and detecting the presence of contaminant. Nano-sensors, such as those based on titanium oxide nanowires or palladium nanoparticles are used for analytical detection of contaminants in water samples. It can be used for removal of sediments, chemical effluents, charged particles, bacteria and other pathogens. Valli.F et al. [5] explains that toxic trace elements such as arsenic and viscous liquids impurities such as oil can also be removed from Nanotechnology. Recently work reported by Mitali Shah et al. preparation of carbon nanosphere from bamboo, considering the properties of bamboo it to develop an eco-friendly and cost effective water purification system using the nanospherical bamboo charcoal, requiring less efforts compared to other existing technologies [6].This purification techniques is able to remove arsenic and fluoride completely from the water. Nano-enabled technologies include a variety of different types of membranes and filters based on carbon nanotubes, nanoporous ceramics, and magnetic nanoparticles as well as other nano-materials. Separation membranes, several polymeric membranes and Nano-filtration membranes with structure at nano-scale may be useful in low-cost methods to produce clean water. The reverse osmosis membranes are also removed about 99% of the solutes, but the concentration of essentials nutrients such as calcium; magnesium ions were reduce below the level of specification of World health organization standard of drinking water. Nanotechnology is gaining greater use in water systems; it is particularly efficient for three purposes such as – treatment and remediation, sensing, detection and pollution prevention.

New technologies are expected to provide solutions which could help in the future on addressing this issues such as solar water purification with the help of concentrating solar power (CSP) technology to realize a small scale single slope solar, still for personal use with adequate efficiency and at low production cost [7]. This low tech technology should therefore be ideally suited for developing, developed and emerging countries [8]. Among the various technological

innovations for water purification, Nanotechnologies are emerging with great potential. Recently membranes designed with nanomaterials are in a position to replace existing conventional membranes and improved water quality as compared with RO System. Nano-filtration systems are capable for removal of water hardness such as calcium and magnesium. They also used to remove pesticides and other organic contaminants.

PLASTIC WATER BOTTLES - PROBLEM TO NATURE

Disposal of plastic water bottle waste has drawn attention not only environmentalist but Physicists also, due to their non-biodegradability and unaesthetic views since these are not disposed scientifically and possibilities to contaminate soil and sub soil water because of leachates. Fossil fuels such as natural gas, oil, and coal are used in production process of plastic; it emits dangerous green house gases, particularly methane and toxic chemicals. Methane is 20times stronger than carbon dioxide. Recycling plastic save energy, valuable resources and helps to protect our environment. Often plastic tops and lids cannot be recycled with the bottles as they may be made of different type of plastic. These plastic can get stuck in the sorting equipment in recycling facilities causing it to stop or break. Nanotechnological based innovative water filters will aid to reduce the subsoil water contamination. Figure1 shows the consumption of plastic water bottles as compared with Indian and foreign universities. Consumption of drinking water bottles percentage is quite high in foreign universities/Institutions as compared with Indian Universities.

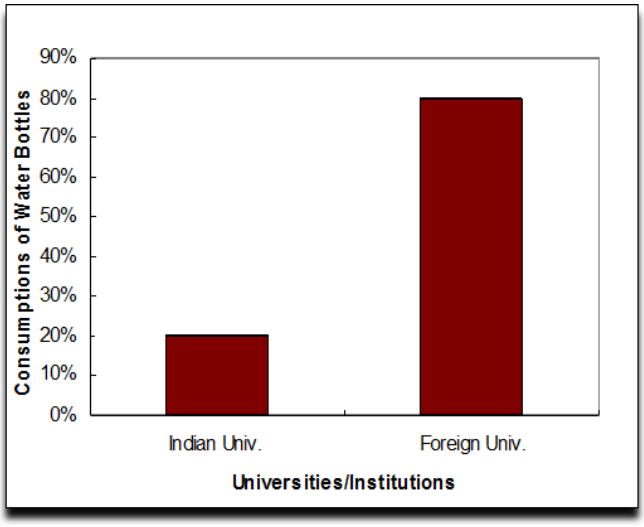

Figure 1: Consumption of Plastic Drinking Water Bottles as a Function of Universities/ Institutions

If we travel by means of any transportation such as trains, flights, Buses, cars, trams etc. as shown in figure 2, % consumption of plastic drinking water bottles are high for population travel by trains, while population travel trends decreases in the following manner for various transportation- Trains<Flight<Buses<Trams <Cars etc.

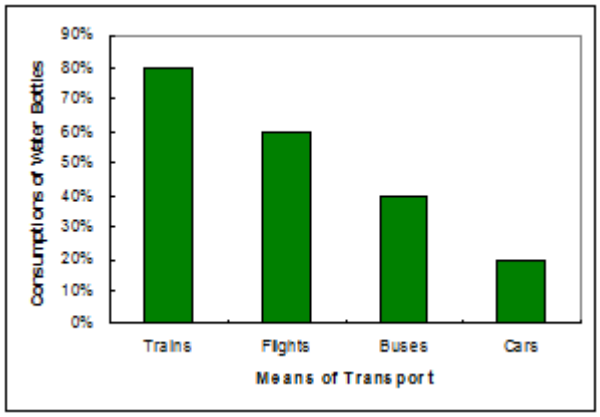

Figure 2: Public Consumptions of Plastic Drinking Water Bottles as a Function of Transport

Data alone cannot supply all the information required to support at the various level of governance. Analysis involves bringing together the datasets to consider the impacts and interactions. In order to help understand and interpret statistical analyses have been used for quantitative information and qualitative knowledge. In view of problem posed due to littering of plastic drinking water bottles consumption increases day by day. We further suggest and infer the scope of Nanotechnology in three grand regions mainly in India, Europe and America and later this will be possible to generalize globally

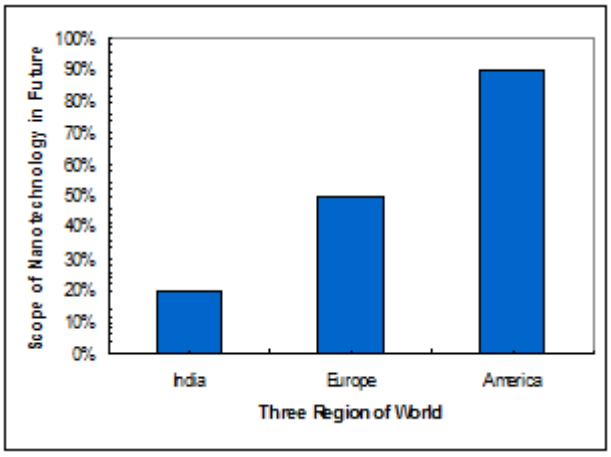

Figure 3: Scope of Nanotechnology in Future for Minimization of Plastic Drinking Water Bottles

The wide scope of Nanotechnology for minimization of the plastic drinking water bottles as shown in figure 3. The output of these analysis give us an overall understanding**,** from this analysis it is possible to synthesize the pollution free sustainable nature in more economically developed countries, where the scope are high for the inclusion of current nanotechnology based nano-filter system, which is still not included in the means of any transport. We would like to suggest every compartment of trains, buses, cars, trams, aeroplanes, should develop the nanofilter based facilities. If we achieve this technological advancement in transportation we will be able to reduce/eradicate 80% of drinking water plastic bottle problem in developed countries, developing countries, and decision supports to develop pollution free sustainable nature. In developing countries plastic bottles waste generated by passengers and passing trains are improbable to quantify, as all these factors are variable

INTEGRATED URBAN AND RURAL WATER MANAGEMENT

Integrated water resource management or sustainable water management classified as systematic process for the sustainable development and monitoring of water resources use in the context of social, economic, and environmental objectives. Integrated water management possesses a numerous challenges- We need to bridge the gap between demand and the supply, to provide enough water for production of food. Water is prerequisite demand for every creature as well as including animals and plants. Each day, a person drinks 2-4 liters of water [9] and uses 20-30 liters for other essential needs. In integrated water resource management variety of water resources users which are interdependent, by maximizing economic and social welfare without compromising the sustainability of vital environmental systems. At operational level, data are needed on day- to- day levels and status of water bodies such as flows, quality, abstraction, and discharge level. A group of internationally recognized professionals and skilled national professionals are needed to collaborate on water management.

Waste and degradation of water resources make it effective to rethink conventional concepts-that attempts to manage different aspects of urban and rural water problems in isolation to an integrated approach. We can solve this by Aligning of urban water sector with rural water supply, industry, energy and environment, management options and technical advancement. New technologies for waste water treatment and new business models such as public and private partnerships and cooperation with government sectors are options. Urban waste water represents a significant pollution load, where sanitation facilities are inadequate, all available channels becomes a mean for waste water disposal. Most disposed wastewater remains untreated, urban wastewater becomes particularly hazardous when mixed with untreated industrial waste. In Rural areas microbial pollution can cause by animal waste, inappropriate waste water disposal and inadequate sanitation facilities, is the most important contaminant affecting human health. In general, the development of sewage treatment lags behind the extension of sewer connections. Agriculture is far by the largest user of water; Agriculture is responsible for much of water pollution, agriculture uses a global average of 70% of surface water supplies which, except for water lost through evapo-transpiration, recycled back to surface water/ground water.

Water charges can help to generate necessary infrastructure development, renewal, and maintenance as a part of sustainable cost recovery. The global market for nanostructure products used in water treatment was worth an estimated $1.4 billion in 2010 and will grow at a compound annual growth rate (CAGR) of 9.7% during the next 5 years to reach a value of $2.2 billion in 2015 [10].The future of nanotechnology depends on the responsible assessment of nanomembrane, nanoparticles and nanomaterials [11]. The quest to ensure that all people have access to clean drinking water is now enshrined in the UN's Millennium Development Goals, which aim to halve the proportion of people without sustainable access to safe drinking water by 2015. According to the World Water Assessment Programme, that will mean improving water supplies for 1.5 billion people [12]. Researchers are developing new classes of nanoporous materials that are more effective than conventional filters [13-16]. For example, a study in South Africa has shown that nanofiltration membranes can produce safe drinking water from brackish groundwater. A team of Indian and US scientists has developed carbon nanotubes filters that remove bacteria and viruses more effectively than conventional membrane filters [17]. Naturally occurring attapulgite clays and zeolites are also used in nanofilters. These are locally available in many places around the world and have innate nanometer-size pores. A study using attapulgite clay membranes to filter wastewater from a milk factory in Algeria has shown they can economically and effectively reduce whey & other organic matter in

wastewater, making it safe to drink [18-21]. Zeolites can also be fabricated. They can be used to separate harmful organics from water and to remove heavy metal ions. Indeed, advocates of nanotechnology suggest that this area of research could contribute to solutions for some of the major problems we face on the global scale such as ensuring a supply of safe drinking water for a growing population, as well as addressing issues in medicine, energy, and agriculture.

CONCLUDING REMARKS

We revived and analyzed the role of nanotechnology to achieve sustainable development and pollution free environment to save the human life**.** Earlier days Reverse osmosis [RO] was the dominating technique but nowadays time has changed, due to inexpensiveness of ultra fine nano membrane technology is taking the market value for development of drinking water. Another very prominent aspect of this technology not only the cost effective matter, the role of this potable drinking water technology will be much more effective to protect the environment from plastic waste. Nanotechnology will automatically reduce the water born disease and toxicity. Contamination of groundwater due to heavy metals is an important issue and billion of people all over the world are at risk; therefore, water treatment is prerequisite demand not only for developing countries, but also for developed countries. Urgent needs for awareness of public, as people are responsible for pollution from the plastic water bottles. Cooperation of this world in the water treatment technologies in favour of economic growth is required.

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